

# Attention and Considerations about Strabismus and Amblyopia: Role of Adapted Physical Education



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Submission: March 20, 2018; Published: April 02, 2018

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## Abstract

The educational system of special schools, in its broad conception, is aimed at general training work, with the aim of integrating fully children and young people with special educational needs to society, taking into consideration the potential of development. In Cuba, attention to people with disabilities in the visual sensory system, is one of the lines prioritized by the Ministry of Education, the schools responsible for fulfilling this social order in school children with strabismus and amblyopic have a transitory nature, being its main objective is to reintegrate into general education, after receiving a system of psycho pedagogical and ophthalmological influences that make it easier for the learner to be included, in the shortest possible time, together with his visual recovery. Hence, the importance that merits its treatment from different edges that pay tribute to the optimal development in which Adapted Physical Education plays a significant role.

**Keywords:** Strabismus; Amblyopia; Visual motor coordination; Adapted Physical Education

## Introduction

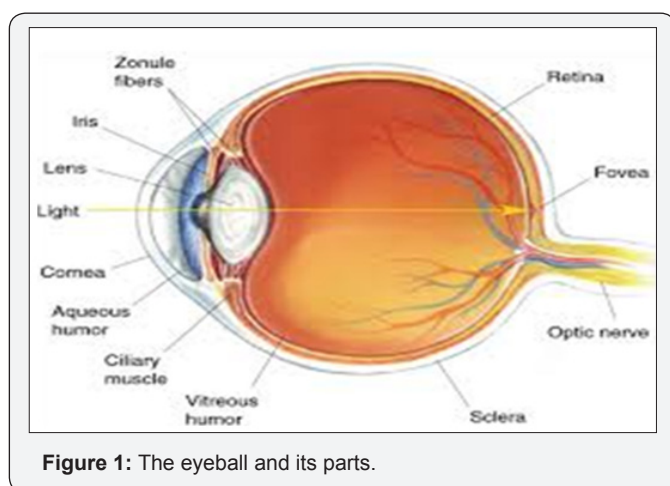


Figure 1: The eyeball and its parts.

The visual capacity allows analyzing the visual stimuli that reach the brain and give correct answers. It is unique for each individual and depends on environmental, psychological or intellectual and physiological variables (visual acuity, visual field, chromatic vision, binocular vision and refraction) [1]. In the vision apparatus, after completion of the embryonic development, several fundamental parts located in the orbits are

distinguished, they are: muscles, organs and eyeballs attached to the optic nerves that, with the rest of the intracranial structures, they process and transmit the information through visual aids [2]. The eyeball is composed of layers or structures that make up its content and what lies within it, which is its content. The content is formed by 3 superimposed layers or tunics: the fibrous or external, composed of the cornea and the sclera; the intermediate or vascular, formed by the iris, ciliary body and choroid and the internal, nervous or sensory called retina. The content is formed by the lens, the aqueous humor and the vitreous body (Figure 1).

If the rays coming from the observed object do not focus on the retina to form the image, it is blurred and prevents the mechanisms of visual development from being installed correctly and perfected. To create a clear image in the retina, four fundamental processes are produced.

- a) **The refraction of the light rays:** Change of direction, the rays pass obliquely from one transparent medium to another of different optical density.
- b) **Accommodation:** Set of ocular modifications that occur when the visual apparatus is stimulated by the

presentation of a nearby object and these modifications consist essentially in the increase of the refractive power of the lens to sharply focus said stimulus on the retina.

**c) The contraction of the pupil:** By means of the muscle fibers of the iris.

The convergence of the eyes, when the luminous rays coming from an object impinge on corresponding points of both retinas. It is intimately related to accommodation, without the convergence is not possible accommodation, because a given accommodative effort corresponds to the same effort of convergence. This function can also be affected (with insufficiency or excess thereof) and produces discomfort such as diplopia (double vision).

The correct visual perception is an essential condition for the development of an adequate learning. The difficulty in it presupposes a distorted perception of reality, manifesting itself in the difficulties of the scholar in recognizing the objects and the relationships they maintain in space, showing awkwardness in everyday tasks and motor skills in general [3]. Binocular vision, as it occurs in humans, is one of the greatest perfections achieved in the transformation of biological species. It is the result of a complex retinocerebral process: optical, sensory and motor, through which the visual sensations that affect each of the eyes are processed and fused in a single perception (fusion) and with a sense of depth (stereopsis) [4].

The evolutionary character of the vision can be analyzed in three fundamental stages [5]:

**a) First Stage (from newborn to one year):** It is characterized by the child's reaction to the stimuli of intense light, for example, after two months the child follows his eyes to a person, after three months the movement follows of the finger and moves the head, at four months looks at his hand and takes the objects and at six can observe an object carefully, for one or two minutes. Developing in this time what is known as visual-manual coordination and binocular vision since both eyes begin to work as a team.

**b) Second Stage (from one year to five years):** There is a greater development of visual memory.

**c) Third Stage (from five to eight years):** After five years, the period of stabilization of vision begins, where what is fundamental is the preparation of the eyes for the learning process of reading and writing and mathematics.

The analysis of the above criteria allows us to appreciate that even though the development of visual-manual coordination and the binocular vision has already started from the first stage, it is not until after the five years that the stabilization period of the view. Attending to the previous criteria, the vision is summarized as the sense of the social relation par excellence, of the learning of the world that surrounds the man and of the communication, constituting the sensory faculty of perceiving and recognizing

figures, showing difficulties in this, the schoolchildren with strabismus and amblyopia.

### Development

According to Pascual [6], visual impairment refers to the deficiency in vision that, despite having correction, affects people in their daily lives in a negative way. There are congenital deficiencies (people have never had vision) and acquired ones (related to the affectation, gradual or sudden vision). Within this disability are:

**a) Blindness:** Visual acuity less than 3/60 or loss of visual field in the best eye and with the best possible correction (categories 3, 4, 5).

**b) Low Vision:** Visual acuity less than 6/18, but equal to or better than 3/60 in the best eye and with the best possible correction (categories 1,2). The strabismus and amblyopuses are also considered part of this group.

Visual development represents for students with strabismus and amblyopia an element of great importance for the acquisition of knowledge, acting as a spontaneous facilitator and multiplier of the process of interaction with the environment that surrounds them, attending to their particular characteristics. School children with strabismus and amblyopic are inserted into the special school system. This educational system in its broad conception, is aimed at comprehensive training work, with the aim of fully integrating children and young people with special educational needs to society, always taking into consideration the potential of the development of school children [7]. In Cuba these schools have a character of transit, their main objective being to reintegrate into general education after receiving a system of psycho pedagogical and ophthalmological influences that facilitate their inclusion in the shortest time possible, together with their visual recovery [8].

"The term strabismus comes from the Greek strabismus, which means to deviate or twist the eyes and is not only cause of decreased vision and amblyopia, but also of psychological disorders, for the aesthetic problem that accompanies it" [9]. The specialized bibliography consulted, reflects different authors that define the term of strabismus, among these: Tamarit [10], Maqueira [11], Serrano [12] and Santaballa [13]. The elements addressed by the previous authors allow appreciating, as a common element of strabismus, the loss of the parallelism of the eyes or of the ocular axes. In this regard, monocular movements are identified, around its three axes of rotation (ducciones) and binoculars, in which the eyes move, in the same direction and sense (versiones), or in the same direction and in the opposite direction, called vergences [9].

Among the sensorial alterations in strabismus are: diplopia and confusion of images, produced the first, by a monocular deviation, where the object that is seen by the fovea of the fixating eye, impresses in the deviated eye an area of retina

not corresponding to the other eye that is right so the object is located in the visual field of each eye in two different places. This can produce diplopia, if the brain does not suppress that second image, called "false image" that is of lower quality. In the same way, the deviated eye receives the impression of a different object in its fovea, which is located superimposed on the object fixed by the fovea of the eye that at that moment does not deflect; that is why confusion of images occurs.

Heredity and prematurity are two of the causes that can cause strabismus. This can be classified in orthophoria that is not more than the parallelism of the ocular axes. If this alignment is obtained postoperatively, it is called orthotropy. The heterotropy or permanent deviation of the eyes is another of the ways in which strabismus is classified. There is also the heterophoria, which are strabismus that cannot be seen with the naked eye; They are only detected in a temporary way in certain circumstances such as physical or mental fatigue, or in the course of tests of occlusion of an eye, where it stops working to maintain parallelism, as there is no binocular visual stimulus that requires it. When describing these types of ocular muscular balance disorders, called phoria and tropias, the prefixes are used (inside or convergent), exo (outside or divergent), hyper (upward) and hypo (downward).

Even when strabismus can manifest itself in different ways and with different levels of affectation, schoolchildren with this disability have an eccentric (not central) fixation, where the projections of images from the outside can be incorrect, bringing with them poor visual perceptions and false concepts or distorted objects and phenomena of reality. Fatigue occurs frequently in these students due to prolonged visual activity, which influences their ability to work, requiring teachers and parents to understand their visual manifestations to help them overcome the limitation and contribute to their development visual. This implies that the activities are carried out taking into account the sense of their deviation and the adaptations that can be made based on this.

An important element to take into account, is the fact that, in schoolchildren with the presence of strabismus, all the images they perceive with one eye become predominant and those that the other eye looks at are not perceived by what becomes amblyopia, produced by strabismus constituting the deviation of the visual axis or cross vision, leading the first form to amblyopia by suppression [14]. The term amblyopia comes from the Greek *amblyos*, weak and *opsis*, vision. This condition appears due to the lack of consolidation of visual acuity, following the lack of stimuli or the presence of these in an inadequate or insufficient way. The period of sensory plasticity is maximum during the first 18 months of life, but maintains a sensitive potential for change, although to a lesser degree, up to seven or eight years, which allows for visual rehabilitation treatment that will be more beneficial the more early, apply. Occlusion of the healthy eye is recommended to improve amblyopic vision.

Amblyopia is the unilateral or less commonly bilateral reduction of corrected visual acuity, which cannot be attributed directly to a structural damage of the eye or the posterior visual pathway. Strabismus, high ametropia or anisometropias and visual deprivations are four of the causes that can cause amblyopia. This can be classified as strabismic amblyopia, which is possibly the most common form of amblyopia, where the fovea of the deviated eye receives images out of focus; anisometric and ametropic amblyopia: it appears when an unequal refraction error in both eyes causes the image to be continuously out of focus in the retina. In its mechanism, only the effect of blurred retinal images intervenes. Amblyopia due to deprivation is due to an obstruction of the visual axis. The retina has not received stimulation of form and sometimes neither of light. The most common cause is a cataract congenital or acquired early.

In addition, depending on the degree of visual acuity, amblyopia can be: moderate, when the degree of visual acuity is between 0.25 and 0.5 and severe, when it is between 0.05 and 0.2. From the criterion of this author, it is valid to highlight the importance that he attributes in the consolidation of visual acuity to the inadequate or insufficient way of showing the stimuli, where it influences, for the characteristics of this, if amblyopia is serious or moderate, aspect this to take into account also to perform the adaptations to the activity. The analysis of the main aspects related to strabismus and amblyopia reflect a singular phenomenon, as strabismus can be the cause of amblyopia, and in turn an amblyopia can cause a strabismus. This allows appreciating that an element that presents difficulty and at the same time is common to both constitutes visual acuity.

In this regard, several authors argue that visual acuity is:

- a) "The ability of the eye to separately determine two maximum points of an object. (...), a good visual acuity allows the discrimination of detail" [15].
- b) "The faculty of the eye in combination with the brain, to perceive the shape and shape of objects at a certain distance" [11].
- c) "The sensory attribute of the system, ability to perceive shape and size of objects" [16].

In the research the criterion presented by Maqueira [11] is assumed, consequently, the importance of knowing the distances that can be worked for each of the cases is highlighted. The measurement of visual acuity in amblyopic students has certain characteristics, in them there is difficulty in separating a letter from a set, so the vision of letters must be measured separately (angular vision) and also forming part of a line (linear vision) [16]. Being consistent with this criterion means taking into account the use of objects separately and as parts of a set.

In general, in the development of schoolchildren with strabismus and amblyopia, it can be seen that significant qualitative and quantitative changes occur, mainly in the

sphere of sensory knowledge by reducing perceptions or visual sensations, incomplete, partial and fragmentary representation of objects. And phenomena of reality, which limits the formation of images [17]. Its role in teaching work is especially fundamental in practical activities related to visual observations [18].

The diminution of the visual sensations cannot be compensated more than receiving all the other stimuli, they present delay in the accommodation process, given by the lack of fixation of the gaze in the environment that surrounds it, absence of convergence on nearby objects and the brightness. The diminution of his visual acuity prevents him from seeing the details; they are characterized by the instability of the attention which negatively affects the volume and the transfer. The difficulty it presents to accommodate or converge harms the possibility of alternating the gaze from the hand to the object and the object to the hand or to another object [3,17].

From the analysis of the previous criterion, the author considers that the decrease in visual sensations can be compensated, in addition to using visual stimuli, by other auditory and tactile stimuli that would favor a multisensory stimulation, considering as a fundamental element the difficulty in alternating the look from the hand or the feet towards an object or vice versa. In the cognitive field, in spite of the lack of adequate visual stimuli, they do not present a decrease in the intellectual parameters, and then there is a difference in perceptual modalities, not of diminished intelligence. In the affective-emotional field, it presents emotional traits conditioned, above all, by the family environment. They usually present fears, due to bad experiences, as a result of family overprotection, they lose personal autonomy, they have to make decisions easier, but with affordable objectives. In the social field, they respond with a picture of social skills similar to conventional schoolchildren, learn that social reality demands, rewards actions and rejects actions and people whose rules of conduct are not acceptable [19].

In the motor field, they tend to be more behind in the achievement of the basic motor skills, they have a worse perception if it is not accompanied by a sound element and in precision shots, they have a delay in the body knowledge and the imitative motor behavior that is the basis of many motor learning, manifest disorders in coordination, balance, laterality and spatial orientation [20]. In summary, it can be stated that attention in schoolchildren with strabismus and amblyopia occurs as a result of the interaction of all sensory stimuli that favor cognitive processes, social relations that directly affect the emotional-volitional sphere and activity. Physics received through Physical Education, in order to compensate for their motor limitations, which hinder their mobility, visuomotor coordination and therefore their relationship with the environment.

According to López [21], Physical Education in the contemporary era, has experienced a broad development of

diverse trends grouped into three models:

a) The medical model, focuses its attention on the structural and organic functioning of the human body and the effects exerted by physical exercise on it. It is based on a traditional pedagogy with hygienic and utilitarian objectives, aimed at the development of physical or motor performance capacity, or physical condition. Learning by students is based on repetition-imitation of technical actions or movement models. The teacher-student relationship is subject to an environment of directivity and imposed discipline.

b) The psychoeducational model emphasizes the student's motivation and learning, rather than teaching the teacher considers the student's decision-making possibilities, through the process of exploration, communication and reflection, which becomes a subject active, builder of his own learning, under the guidance of the teacher. Among the theoretical and methodological precepts with which this model is integrated is psychokinetics, aimed at acquiring new modes of action that allow the subject to adapt to the different situations of the environment and their own availability. It pursues a double objective: on the one hand the development of basic motor skills and on the other, laying the perceptive-motor bases of other aspects of education, such as school learning, for example, literacy, which is based on tactile coordination Fine and oculus-manual. This model of Physical Education class is determinant to achieve the development of visual-motor coordination in schoolchildren with strabismus and amblyopia, it allows them to appropriate knowledge, under a teacher-student interaction that translates into development.

c) The sociocultural model addresses the role they play: the body, exercise and sports in health. It is an educational process that moves away from an individualistic or behavioral view of health. To develop the Physical Education classes in the students of the group under study, under the ideas that rule this model, allows assuming the importance of physical exercise for its growth and anatomophysiological development.

d) The analysis of each of the models allows us to appreciate that it is not possible to develop the teaching-learning process of Physical Education centered on a model, or to adopt an eclectic position, taking all of them as in a simple summation, that evidences the need for a integral physical-educational approach, which involves contemplating as content, objectives, learning activities and evaluation activities, not only the development of skills and abilities, but also ensuring the learning of concepts, system of concepts and modes of reference, together with training of attitudes, norms and values and integrating the new knowledge to the previous knowledge or antecedents of the students to print a meaning and personal sense to the learning's.

The analysis of the aforementioned and with which the author agrees allows to guarantee the contribution of Physical Education in the stimulation of visual-motor coordination to achieve the comprehensive education of schoolchildren with strabismus and amblyopia. However, considering the particularities of these students, there is a need to contextualize the benefits in Adapted Physical Education. According to Ramírez [7] Adapted Physical Education for schoolchildren who have special educational needs due to disability, has an eminently corrective-compensatory sense. Its corrective nature is determined by the system of pedagogical activities that are applied with the objective of eliminating or diminishing the alterations of the individual and the compensatory activity, it is carried out through activities where most of the analyzers not damaged or less damaged participate, which makes possible the organization and structuring of all the functions of the organism. Performing this type of activity is a way to make these students achieve useful and prepared citizens.

According to this author, the need for a scientific approach based on attention to these students, is the expression of changes and technological development that currently invades the educational sector nationally and internationally. This is evident in a psycho-pedagogical approach and a clinical approach.

### Psychopedagogical Approach

- a) Focus attention on the individual's potential.
- b) More personalized and comprehensive study with the purpose of designing strategies that give an educational and development response.
- c) Differences between people are conceived as something common. Diversity is the norm. Nobody is totally capable and nobody is totally disabled.
- d) Integrationist trend, socializing for the intervention. (From the culture of segregation to the culture of integration.)
- e) Personalized treatment, aimed at the person and their integral development.

### Clinical Approach

- a) Focus attention on the defect.
- b) Negative characterization, looking for what the child does not have, what they lack, what they cannot do.
- c) Classification of people in normal and abnormal.
- d) Predominance of clinical concepts and methods.
- e) Segregationist tendency for the intervention.
- f) Generalized preconceived treatment, directed to the entity, to the pathology and not to the person.
- g) Predominance of individual treatment, isolated and little exploitation of the collective and normalizing contexts.

The analysis of the previous approaches allows appreciating, to consideration of the author, the need of a psycho pedagogical approach in the attention of students with strabismus and amblyopia, when considering as an essential aspect the particularities of this population. For these, participating in the Adapted Physical Education represents, in addition to the benefits in the psychological order and health in general, to be able to express through movements the development achieved in the different basic motor skills and abilities, within these the coordination (visual-motor coordination).

### Conclusion

The difficulty that schoolchildren present with strabismus and amblyopia to accommodate or converge harms the possibility of alternating the gaze from the hand to the object and the object to the hand or to another object, which implies difficulties in the visual-motor coordination. Their attention is given as a result of the interaction of all the sensory stimuli that favor cognitive processes, the social relations that directly affect the emotional-volitional sphere and the physical activity received through Physical Education. The sense of deviation and the degree of visual acuity are essential aspects to take into account.

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DOI: [10.19080/JPFMTS.2018.02.555597](https://doi.org/10.19080/JPFMTS.2018.02.555597)

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